ABSTRACT

High throughput systems and processes for recrystallizing thin film semiconductors that have been deposited at low temperatures on a substrate are provided. A thin film semiconductor workpiece is irradiated with a laser beam to melt and recrystallize target areas of the surface exposed to the laser beam. The laser beam is shaped into one or more beamlets using patterning masks. The mask patterns have suitable dimensions and orientations to pattern the laser beam radiation so that the areas targeted by the beamlets have dimensions and orientations that are conducive to semiconductor recrystallization. The workpiece is mechanically translated along linear paths relative to the laser beam to process the entire surface of the work piece at high speeds. Position sensitive triggering of a laser can be used generate laser beam pulses to melt and recrystallize semiconductor material at precise locations on the surface of the workpiece while it is translated on a motorized stage.